



Project in Development and the Environment

**USAID Mission to Slovakia
Technical Assistance on
Environmental Issues**

August 1994

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**USAID Mission to Slovakia
Technical Assistance
on Environmental Issues**

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EXECUTIVE SUMMARY

Under the aegis of the Environmental Action Program (EAP), a four-person USAID team spent three weeks in the Slovak Republic in June and July 1994. The primary objective of the mission was to identify and support investments to improve environmental health. The team met with officials of central and local government and organizations involved in environment and public health, and visited representative industrial and municipal facilities.

The team made the following principal observations related to the Slovak environmental situation:

- The most serious environmental health problems in Slovakia are linked to site-specific pollution from industrial and energy facilities.
- Related environmental health data tend to be incomplete and are not sufficient for site-specific analysis of human health issues.
- In Slovakia, unlike Poland and the Czech Republic, low-level pollution from the use of brown coal for residential and district heating is not widespread.
- Fees and fines for environmental pollution are, in general, either too low or too seldom enforced to play a major role in stimulating environmental investments.
- The domestic capital market is poorly structured to finance investments, particularly those needing long maturities as in environment.

EAP criteria for selecting projects include an assessment of: (1) the degree to which additional investment can improve environmental health and (2) the project's economic viability. The second criterion is important because USAID provides only technical assistance, although technical assistance may include helping to identify and obtain funding. Funds for the investment must be obtained from other sources. Given these criteria and the observations noted above, project selection should incorporate:

- A focus on industrial facilities in environmental "hot-spot" areas with heavily polluting industries.
- A measure of environmental health based on the facility's emissions and the health statistics of the surrounding area.
- A focus on export-oriented companies that need to meet European Union environmental standards to maintain market access.

- A focus on companies with sufficient cash flow to finance part of the proposed environmental investments and the willingness to obtain outside financing.

Based on these considerations, it is recommended that follow-up to this mission include:

- Technical assistance to at least one project to (1) assess the individual project and (2) increase understanding of what is needed and achievable on a project basis.
- Close cooperation with the Harvard Institute for International Development on the policy side of the EAP to support the policy process and link specific investment projects to policy formation.
- Fielding another mission to increase the set of potential projects, focusing on areas where regional EAP activities are concentrated.

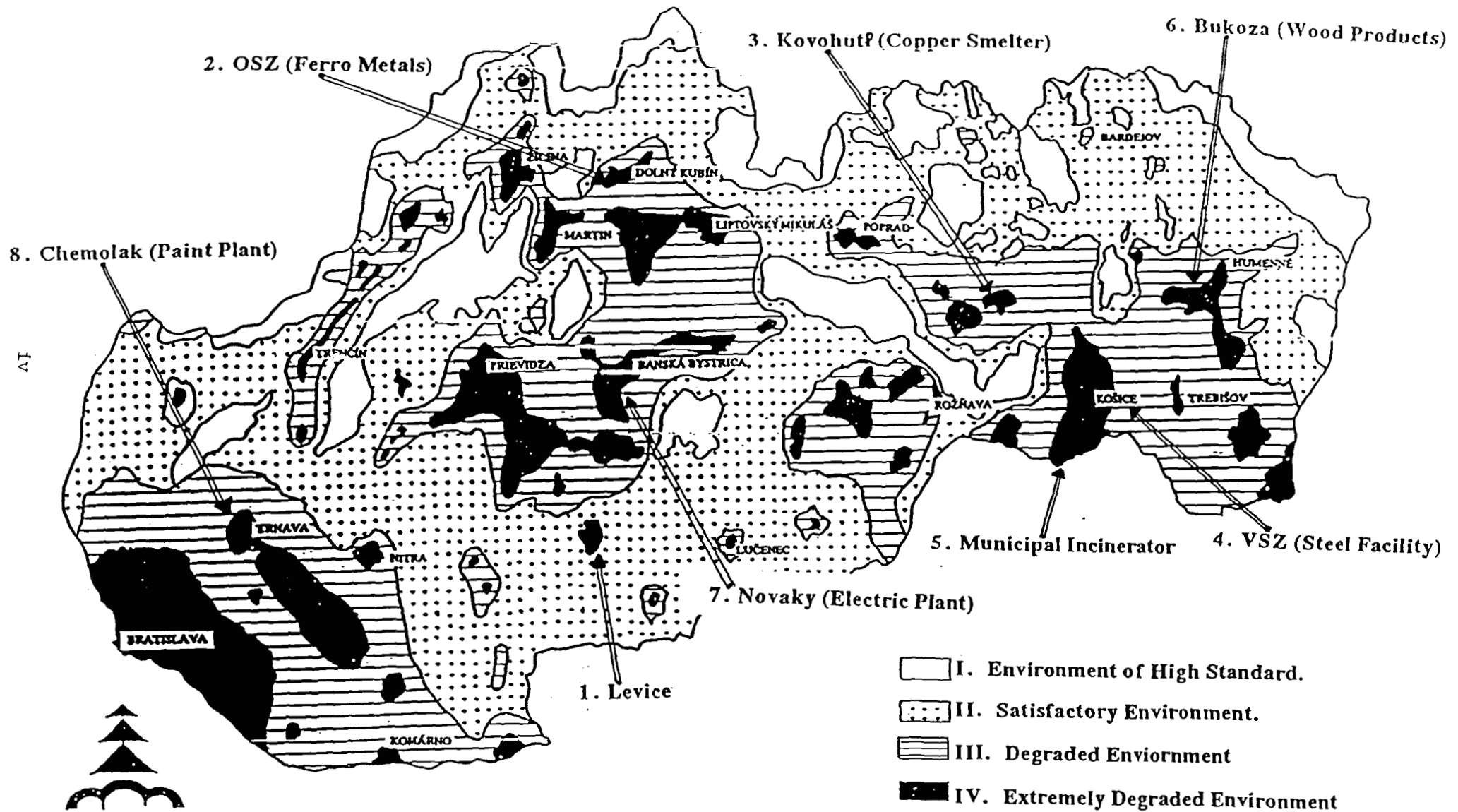
The types of USAID technical assistance that appear most appropriate include assistance in preparing economic and business plans and conducting financial and accounting evaluations. Design and engineering work in Slovakia is of high quality, but some technical engineering assistance could be helpful in evaluating unique environmental problems and least-cost alternatives. There does not appear to be a major need for importing environmental technology. A table summarizing the projects visited and their human health and environmental impact is presented on the following page.

Summary Table of Environmental Projects Reviewed by Mission

		Project		Selection	Criteria		
Site	Facility	Primary Environmental Issues	Environmental Health Benefit	Impact Scope	Economic Viability	Project Status	Comments
1	Levice District	Water, Soil	Undetermined	Moderate	Project Undefined	Research	Inconclusive environmental health data.
2	OFZ Ferro Metals, Istebne	Air, Water	Low - Moderate	Low	Good	Pre-feasibility	Progressive environmental management
3	Kovohuti Copper Smelter, Kompachy	Air, Water, Soil	Very high	High Local	Unknown	Unknown	Limited site visit.
4	VSZ Steel Plant, Kosice	Air	Moderate	Significant Regional	Good	Feasibility	Environmental loan proposal submitted to EBRD
5	Municipal Waste Incinerator, Kosice	Air	Low - Moderate	Low - Moderate	Moderate	Feasibility	Probable foreign investment.
6	Bukoza Wood Products, Vranova	Air, Water	Potentially High	Moderate - High	Low - Moderate	Research, Pre-feasibility	Poor environmental commitment by management
7	Novaky Electric Plant, SEP, Novaky	Air	High	Moderate - High	Moderate	Implementation	Ongoing environmental investments delayed by financing limitations.
8	Chemolak Paints, Smolenice	Air, Water	High	Potentially High Local	Low - Moderate	Research, Pre-feasibility	Need National Policy on VOC's.

Slovak Republic: Sites Visited by EAP Mission

20 June - 15 July



SECTION I

INTRODUCTION

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SECTION I INTRODUCTION

A. Overview and Recommendations

Pursuant to the U.S. Government's commitment under the Environmental Action Program (EAP), signed in Lucerne in April 1993, a four-member team carried out a project identification mission to Slovakia between 20 June and 15 July 1994. This mission was undertaken as an EAP Project Preparation Committee (PPC) activity to identify and support investments that improve environmental health. The mission included interviews with national and local officials as well as site visits to various industrial and municipal facilities throughout Slovakia.

The Slovak economy has the same basic problems of declining GDP and inflation as the other economies in transition in Central and Eastern Europe (CEE). Economic problems more specific to Slovakia include: (1) a limited internal market (although Slovakia and the Czech Republic are in a customs union) and (2) heavy reliance on imported raw materials and energy. Unlike Poland and the Czech Republic, Slovakian coal resources are insufficient for domestic consumption.

The resource base and economic development of the Slovak Republic have created a heterogenous mosaic of location-specific environmental problems. Agricultural areas suffer from heavy use of fertilizer and pesticides that pollute water supplies. Water pollution problems are aggravated by relatively low water resources. Industrial pollution is often highly localized, both because of Slovak topographic characteristics and the relatively small size of many of its industrial facilities. These factors tend to confine air pollution to immediate areas surrounding plant operations.

Given these conditions, several investment projects that might be appropriate for USAID technical assistance were reviewed. Any ranking of projects, however, in terms of their relevance to the EAP and national priorities is hindered both by limitations in available environmental health data and the weakness of the capital market. Nevertheless, these uncertainties are inherent to the region and not specific to Slovakia. It is recommended that USAID:

- Support the EAP process in Slovakia by providing technical assistance to develop "bankable" projects.
- Provide technical assistance in the near-term to at least one project, both to assess the project and increase understanding of what is needed and appropriate.
- Field a follow-up mission to identify additional projects.

- Work closely with the Harvard Institute for International Development on the policy side of the EAP in Slovakia to support that process and to focus on projects that support environmental priorities.

The types of USAID technical assistance that appear most appropriate include assistance in preparing economic and business plans and conducting financial and accounting evaluations. Design and engineering work is of high quality, but most officials reported uncertainties and difficulties in developing economic evaluations and business plans. Further, they have little knowledge of where and how to obtain financing, due to both their inexperience in this area and the shortcomings of the domestic capital market.

While preliminary, the project that appears most appropriate for USAID technical assistance is a request by VSZ for assistance in further developing an environmental investment proposal submitted to the European Bank for Reconstruction and Development (EBRD). VSZ is an iron and steel facility, the largest industrial concern in the country, and a major polluter.

B. Major Issues

Environmental health. General environmental and health data clearly indicate that environmental degradation has a substantial impact on the health of Slovakia's citizens. Average life expectancy is five to seven years less than in Western Europe (e.g., 66-68 for men in Slovakia versus 71-73 for men in France and Germany). Malignant tumors and circulatory system disease cause almost three-fourths of all deaths, and the incidence of cancer has doubled since 1965. These health statistics are related to the country's substantial pollution by sulphur dioxide, nitrates, carbon monoxide, and heavy metals. Contamination affects the country's air, water, and soil resources.

Despite these statistics, a major problem in selecting projects is the lack of information on environmental health. While health and environmental data exist on a national and district basis, the level and degree of causality are often not clear. Further, there is substantial interaction between environmental factors and economic and public health factors. For example, in the district of Levice, which is considered to have some of the worst health and environmental conditions in the country, the most-often cited public health factor is a decline in nutrition standards as a result of the economic recession.

Further, monitoring and analysis of pollutants and related health effects are limited in both scope and frequency. Collected data tend to be poorly reported. For example, a pulp and paper facility said it believed it had a problem with discharging chloride into the neighboring river, but because towns downstream from the facility had never complained, the company did not judge the problem serious.

Project identification. Given the lack of data on the health impact of specific facilities, the initial process of selecting projects for USAID technical assistance must rely on emissions data from the facility and the implied health effects of the emissions, cross-checked against district-level data on mortality and morbidity. This approach serves well where

pollutants and emission sources are limited. In other areas, however, such an approach might fail to identify the highest-priority facilities. Nor does such an approach provide much guidance in deciding where to concentrate efforts.

An important aspect of the situation in Slovakia is the heterogeneity of environmental projects. There is no one predominant source of pollution, such as the brown coal in southern Poland or the industrial facilities of the northern Czech Republic. Rather, environmental issues tend to be regional, as for agriculture, or location specific, as for industrial and municipal facilities.

In agricultural areas, nitrates from fertilizers and pesticides are an important environmental issue. Industrial pollution tends to be site specific, depending on the type of factory, its emissions, and the topography of the surrounding area. The implication is that fewer general project initiatives (such as the district heating projects in northern Bohemia) are anticipated in Slovakia. Rather, potential projects in Slovakia could well have unique environmental impacts and thus technical solutions. The burning of brown coal causes pollution from some district heating, power generation, and industrial facilities, and could at times be appropriate for USAID technical assistance. However, because most district heating facilities are owned by the national government and are in the process of converting from coal to natural gas, the team did not evaluate specific district heating projects.

Financing. The domestic capital market is weak, and state environment funds are limited. International capital may be available, but only for the largest and most economically viable projects. Financing problems such as the following are typical of the CEE region:

- Domestic bank capital tends to be limited, with higher real interest rates than in the international capital market and only short maturities.
- The ability to raise capital through public equity or debt issues is not well developed.
- International capital flows are limited but exist for some enterprises.
- Even the largest companies lack experience in evaluating financing and capital market options.

Limited financing is available, however, for environmental investments. Some companies have internally generated cash flows available for investment. Commercial banks have funds for at least the two- to three-year horizon. Foreign capital, both in terms of private equity investment and some lending by international financial institutions, does exist in Slovakia. Being able to tap these funds for environmental investments will be difficult, however, given the economic and restructuring demands on this capital.

In addition, opportunities to use funds for environmental investments are limited by the absence of tax preferences or investment credits for environmental purposes. State funds

designated for the environment are scarce and currently consist mainly of small grants to municipal projects. Work is underway to create a larger credit facility for environmental projects, which would favorably impact the funding of environmental investments.

Environmental regulation. Fees and fines are minor costs to businesses, and major environmental investments are not justified on cost savings. Further, individual facility exemptions from fees and fines are widespread, and some companies doubt the government's willingness to enforce regulation. A positive force for environmental investments is the willingness of more export-oriented businesses, such as VSZ and OFZ, to invest in environment improvements to reach European Union standards. Such investment is needed to improve access to export markets.

SECTION II

PROJECT REVIEW AND SELECTION CRITERIA

SECTION II

PROJECT REVIEW AND SELECTION CRITERIA

Introduction

This section summarizes selection criteria to assess specific projects for technical assistance. Two sets of criteria were established. For use in the field, a set of operational project selection criteria was developed to assist the team in initial screening of projects warranting detailed review. A second and more detailed set of criteria was developed for final project selection.

A. Simplified Criteria for Initial Screening

The simplified criteria were developed in collaboration with the Ministry of Environment to provide a cost-effective process for gathering data on projects from various agencies and to encourage as many agencies as possible to submit project proposals. The simplified criteria will form the basis for the initial screening to be carried out by the ministry and USAID. These criteria were developed using the experience of the previous missions to Poland and the Czech Republic. The simplified criteria are presented in Table 2.1. on the following page.

B. Detailed Project Criteria for Project Selection

In addition to the simplified criteria, the team also developed a set of detailed criteria to be used in the second screening. This screening will identify projects that are environmentally beneficial from the human health perspective, contain financial and managerial elements that lend themselves to technical assistance, and have a reasonable chance of project success within 24 to 36 months. The project will be considered successful when its implementation is complete and environmental health-related pollution has been reduced.

The detailed evaluation criteria are divided into environmental criteria and financial/management criteria as follows:

B1. Environmental Criteria

Air pollution. Because of the clear impacts of air pollution on human health, technical assistance should focus on projects that lower air pollution emissions. The pollutants targeted for reduction are:

- Total suspended particles (TSP)
- Sulfur dioxide (SO₂)
- Nitrogen oxides (NO_x)

Simplified Project Review Criteria for Technical Assistance to Slovakia

Under the Lucerne Agreement, the U.S. Agency for International Development (USAID) will provide grant funds for technical assistance to prepare environmental projects for consideration by funding agencies. Technical assistance may be provided for project design and feasibility studies, financial and accounting evaluations, economic and business plans, and preparation of financial documentation. The selection of projects and the type of technical assistance provided will be jointly determined by the Slovak authorities in cooperation with USAID.

Priority 1. Environmental health benefits. The Lucerne Agreement's first priority are projects that have a substantial impact on environmental health by lowering the incidence of environmental and pollution-related illness. These health benefits would result from a reduction of primary pollutants, including:

- Air pollutants: sulphur dioxide, particulate matter, nitrogen oxides, carbon monoxide, hydrocarbons, toxics, organic chemicals, and heavy metals.
- Pollutants in drinking water: reductions in the volume of polluted water, organic chemicals, heavy metals, toxic chemicals, and phenols.
- Other pollutants can include hazardous wastes and soil contaminants that harm human health.

Priority 2. Impact. The program targets projects that will have a significant impact on local conditions or can be replicated regionally or nationally.

Priority 3. Economic viability and profitability. Both industrial and municipal infrastructure projects are eligible for technical assistance, but because project funding will be in the form of loans, selected projects must be economically viable.

Priority 4. Project phase. The technical assistance program has the goal of demonstrating achievable results in a relatively short time. Therefore, the program targets projects that already have completed prefeasibility and/or feasibility studies and require specific technical assistance to achieve implementation.

- Carbon monoxide (CO)
- Hydrocarbons
- Metals
- Toxics
- Organic chemicals

Water pollution. Projects that protect water resources, specifically drinking water resources, represent the second priority for technical assistance. The protection of drinking water sources focuses on pollution by:

- Organic compounds
- Heavy metals
- Toxics
- Phenols

Soil contamination. Reducing or mitigating soil contamination should receive third priority. Such projects target ongoing soil contamination by industrial facilities that impact human health. Past pollution of soils from industrial resources, unless ongoing, is not considered a high priority because of the limited mitigation options available.

B2. Financial and Management Criteria

Time to implementation. An important issue in selecting projects for technical assistance is the length of time required to complete the project. Projects that can be completed within two to three years of securing financing should receive priority over those requiring longer periods of time. This criterion allows selection of projects that will have the most immediate impact on human health.

Privatization status. The technical assistance program places priority on helping the private sector reduce emissions. Therefore, the privatization status of the recipient organization should be considered in selecting projects.

Industry financial stability. Given the rapidly changing economic conditions facing industry in Slovakia, priority should be given to industries that have greater financial stability, are (or have the potential of becoming) internationally competitive, and are likely to remain in full operation in the foreseeable future.

Management capability and commitment. The capability and commitment of the recipient organization's managers is critical to the success of technical assistance. Therefore, the commitment of the organization's management to solving environmental issues and its capability to manage environmental investments should be evaluated.

Profitability. The profitability of the potential recipient organization is critical because of the impact of profitability on firm stability. Profitability increases the attractiveness and credit worthiness of the organization as a recipient of an environmental investment.

Project financing status. The availability of other project financing should be evaluated, including the ability of the recipient to provide part of the overall investment required to carry out the project.

SECTION III

FINANCIAL AND REGULATORY CONSIDERATIONS

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SECTION III

FINANCIAL AND REGULATORY CONSIDERATIONS

This section summarizes financial and regulatory issues influencing environmental project financing in Slovakia.

A. Environmental Fees and Fines

Firms operating in Slovakia are required to pay fees for emitting pollutants. Fees are charged for emitting the primary pollutants sulfur dioxide, nitrogen oxides, and carbon monoxides, as well as a number of other pollutants classified according to their toxic and carcinogenic potential. The fees for emission of these substances are listed below:

Fees for Pollutant Emissions

Pollutant	Fee Rate (Sk per metric ton)
Primary Pollutants:	
Solid Waste	3,000
Sulfur Dioxide	1,000
Nitrogen Oxides	800
Carbon Monoxide	600
Other Pollutants:	
Class 1 (most toxic)	20,000
Class 2	10,000
Class 3	5,000
Class 4 (least toxic)	1,000

The fees are payable monthly and quarterly for the previous year, and are based on the annual report submitted by the firm to the Ministry of Environment. Because of the financial position of many firms operating in Slovakia, the Ministry of Environment developed a schedule for collecting these fees over time. The schedule gradually increases the percentage of assessed fees a firm must pay as follows:

Schedule of Fees Payable for Emissions

Year	Percentage of Fees Payable
1992	20
1993	40
1994 - 1995	60
1996 - 1997	80
1998 and Beyond	100

In addition to relaxing payments, the Ministry of Environment has granted a number of exemptions to firms unable to pay the assessed fees for financial reasons. Additionally, firms may appeal for a reduction in assessed fines. Fines assessed, resolved through appeals, and paid in 1992 are presented below:

Environmental Fines Imposed, Resolved, and Paid in 1992

	Fines Assessed		Resolved w/Appeal		Fines Paid	
	Number	Amount (Sk)	Number	Amount (Sk)	Number	Amount (Sk)
Air	65	2,781,700	12	1,205,000	23	444,400
Water	986	21,399,693	285	8,307,176	435	9,179,586
Waste	87	2,410,500	35	1,511,500	39	339,500
Other	304	949,770	101	382,900	172	455,840
Total	1,442	27,541,663	433	11,406,576	669	10,419,326

The data illustrate the problems associated with the current system of environmental fines. Many firms either do not pay the fines or have them reduced, so that in the end only approximately 50 percent of assessed fines are paid. This lowers overall compliance costs and reduces the economic incentive for investing in environmental projects.

B. Slovak Fund for the Environment

The Slovak Fund for the Environment (SFE) was established to concentrate financial resources for environmental investments. The SFE is administered by the Ministry of Environment, with an Executive Committee composed of representatives of the ministries of environment, finance, and economy, as well as municipal and parliamentary representatives. The SFE provides grants to projects in air protection, waste management, water quality, and nature protection. Most grants are small, averaging approximately Sk 280,000.

SFE revenues are derived primarily from environmental fees and fines charged by the state, grants from the state budget, and contributions from domestic and international organizations. The SFE made approximately Sk 1 billion in grants in 1993. These grants included Sk 360 million for air pollution projects, Sk 260 million for water projects, and SK 18 million for solid waste management. SFE's investment portfolio reflects the regional distribution of income from fees and fines, with the exception of the Bratislava region, which provides Sk 15 million in revenues and receives Sk 500,000 in grants.

The SFE faces a number of limitations in funding environmental investments. Changes in levels of state support and the lack of strict enforcement of fees and fines significantly undermine its long-term funding. The small size of SFE grants is insufficient to leverage additional funding from other donors. The SFE is unable to provide grants to joint-stock companies (i.e., those in the initial stages of privatization), and therefore is unable to make the key industrial investments required to reduce emissions at many of the country's largest pollution sources. Additionally, the SFE annual budget process does not allow the fund to provide multi-year grants for large projects. Finally, because the number of projects is large (approximately 3,200 per year) and the fund's staff is small (20 employees), grants receive little or no supervision or follow up.

SECTION IV

PROJECT DESCRIPTIONS

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SECTION IV PROJECT DESCRIPTIONS

This section summarizes potential projects evaluated by the mission team.

A. Levice

Levice is a medium-sized city in southern Slovakia, about 80 km east of Bratislava. The city has surrounding agricultural areas and a variety of medium-sized industrial facilities, but has no dominant factory or other pollution source. In conversations with ministry officials in Bratislava, Levice was often cited as one of the most polluted cities in the country. The Environmental Strategy Report, however, does not include Levice as one of the nine most polluted areas. In Levice, SO₂ emissions per square km are about the average for Slovakia, while NO_x emissions are lower than average.

In contrast to the emissions estimates, available health data indicate higher than average rates of morbidity and mortality that may be related to the environment. The average life expectancy for women is about the average for Slovakia, but the life expectancy for men is much lower. Indeed, Levice is one of the three counties in the country with the lowest life expectancy for men. No single specific cause of death differentiates Levice from other regions of the country. The table on the following page compares health data for Levice to the averages for Slovakia. In contrast to the difference in life expectancy for adult males, Levice has a lower incidence of death among infants under age one: 11.34 per 100 live births, versus 12.58 for Slovakia as a whole.

This kind of summary data is hard to use in judging a region's health problems or identifying their likely causes. Without a systematic adjustment for other factors, particularly demographic, lifestyle, and occupational factors, it is difficult to isolate environmental causes or any single environmental factor. However, the very high rate of neoplasms has been sustained over a long period and is probably indicative of a genuine differential.

Moreover, health officials in the region are seriously concerned with the poor state of residents' health. They draw on their considerable experience, not solid data, to point to a number of environment-related factors, including poor-quality drinking water and exposure to radon. They attribute the poor drinking water to contamination of the aquifer by fertilizers and pesticides used in agriculture, and have evidence of residues in the drinking water. Nitrate levels in the drinking water are 10 times the Slovak norm.

In addition, high levels of radon have been recorded, but the number of locations measured was so low that the data are more anecdotal than statistically useful. It is not unreasonable, however, to expect some indoor radon, given the high levels in the region's

**Comparison of the Incidence of Disease Between
Levice and Slovakia as a Whole
(incidences per 100,000)**

Category	Levice	Slovakia
Infections and parasites	2.5	3.9
Neoplasms	248.4	200.5
Endocrine, nutritional, and metabolic diseases	11.6	19.2
Diseases of blood and hemopoietic organs	0.0	0.6
Mental disorders	23.2	3.6
Diseases of the nervous system	4.1	4.3
Diseases of the circulatory system	769.1	520.6
Diseases of the respiratory system	66.2	77.4
Diseases of the digestive system	79.5	51.6
Diseases of the genito-urinary system	29.0	19.9
Suicide	30.6	15.9
Injury and poisoning	79.5	76.0
Total	1353.6	1008.0

soil. The effects of radon have been shown to be much higher in cigarette smokers. Smoking levels in Slovakia are very high, thus increasing the chance that radon may indeed be a significant health risk.

Potential projects. As the comparisons in the above table show, Levice is a city with serious human health and environmental problems. There are many reasonable hypotheses about causes, environmental and otherwise, and it is likely that a series of lifestyle and environmental factors are related to the high morbidity rates. Medical personnel in Levice believe the first environmental health priority must be to launch a comprehensive investigation of the factors impacting human health.

Medical officials would also like to construct a wastewater treatment facility. This effort is unlikely to have a clear health impact, however, though it would be ecologically beneficial. The mission recommends that any remedial efforts undertaken in advance of a comprehensive health study be directed toward mitigating the degradation of the drinking water supply from agricultural use of pesticides and fertilizers. These pollution sources are likely to have the clearest health impact, given the available data.

B. Oravské Ferozliatinárske Závody (OFZ), Istebné

Istebné is a small town located in a broad valley west of Dolny Kubin, in northern Slovakia. Aside from the ubiquitous district heating plants, OFZ is the only important source of pollution in Istebné or Dolny Kubin. Istebné is near the border of four counties, which are all affected by the plant's emissions. The location makes it difficult to assess the health impact of the plant, since health data are collected at the district level and no single district's data capture the plant's full impact. The life expectancy for both men and women in the four counties is at or slightly above the national average. Sources in Slovakia attribute this difference to life style, occupational risk, diet, and medical care, not environmental factors. Emissions rates for SO₂ and NO_x in the surrounding counties are slightly above the national average, but Istebné is not considered one of the four most polluted areas (Bratislava, Banska Bystrica, Kosice, and Vranov-Michalovce.)

Two potentially major sources of pollution exist within the plant. The first are the furnaces, which emit gas and dust. The second pollution source is the tailings pile, which is responsible for fugitive dust and groundwater contamination. The plant has been working since 1984 to reduce airborne emissions. Each furnace has ducts to a comprehensive flue gas control system consisting of cyclones and Slovak-made fabric filtration systems. On inspection, the equipment was in very good condition, and there were no visible emissions from the plant. The plant reports that the dust control system removes 98.5 percent of emissions, achieving stack emissions concentrations of less than 20mg/m³, which is within U.S. standards.

The system's only significant flaw is that trapped dust is disposed of on the tailings pile, a source of fugitive dust emissions. The Ministry of Industry expressed concern that soil in the vicinity of the plant may have been contaminated with heavy metals before the plant installed the current dust controls. This concern was supported by Dr. Fabianova of the regional hygiene office in Banska Bystrica, whose studies have indicated that contaminated food was a serious problem in the country. The plant has not collected data from the surrounding soils, but studies at OFZ's other plant in Siroka indicated there was indeed metal contamination, but that normal rains will reduce levels by 75 to 80 percent in three years.

The tailings pile contains 5 to 6 million tons of waste collected over 40 years. Its large amounts of very fine dust can be easily displaced by hauling vehicles, moderate winds, or other activity on the piles. The pile is adjacent to a wetland area and only a short distance from a small tributary of the Orava river. While the plant has launched a program to determine whether chromium is leaching into the groundwater and reaching the Orava river,

concern remains that the metals may contaminate drinking wells downstream from the plant. The data collection effort is as yet incomplete, and there are no definitive data showing contamination from the plant.

Some of the waste is sold to other companies for building materials such as wall board. Metals in the waste are recycled to the furnaces, but the recycling has a practical limit. The plant is completing a facility to pulverize the waste and recycle the chromium. The non-metallic waste will be used for making concrete in a small plant that has just been completed. The concrete plant will certainly help reduce the volume of the waste pile and mitigate potential runoff. However, the plant is not connected to the furnaces or the dust treatment plant. The material for the recycling/concrete plant will be hauled directly from the outside pile. Because the dust on the pile is so fine, this hauling operation will certainly result in displacement. There are no residences within 300 m of the plant, however, and any health effect is likely to be occupational or to result from surface deposits on the surrounding wetlands and river.

OFZ's environmental improvement program results in two direct benefits to the facility and its employees. First, OFZ staff who live in the region benefit directly from the improved air quality. Second, the environmental improvement program has allowed the plant in part to meet internationally recognized ISO 9000 standards. In addition to setting standards for product quality, ISO 9000 sets standards for environmental production practices. After a three-year effort, OFZ has achieved ISO 9000 certification. This is a major achievement and may be unique in Slovakia.

Financial considerations. The plant is operating near capacity and showed a small profit for the last fiscal year. The plant's production capacity is 200,000 tons of ferro alloys per year. Expected production in 1994 is 190,000 tons, reversing the sharp downward trend of 1992-1993. Profit in 1993 was about \$137,000 on sales of \$35,340,000 (0.4 percent). This very modest profit is not unusual for the primary metals industry, which has been adversely affected in recent years by a worldwide recession in construction and car and airplane manufacturing, particularly in Europe. Mr. Vladimir Klocok, general manager, expressed his view that the company was in excellent financial condition for 1994.

The plant's efforts to control airborne emissions are extraordinary. Under Slovak law, plants must pay fees for airborne emissions of SO₂, dust, and nitrous oxides. A constant, moderate fee rate has been set, but is being phased in steps through 1998. In 1994, plants must pay 60 percent of the fee. The fees that OFZ avoided in 1994 are far less than either the operating cost of the flue gas control system or ongoing investment in the new cyclone. OFZ's pollution control efforts and the USAID team's discussions with plant managers clearly demonstrate the facility's serious commitment to environmental quality.

The plant pays modest fees on annual additions to the tailings pile, but is not liable for waste accumulated in prior years. The cost of storing the waste on site has been described as "acceptable." However, the plant recognizes that the tailings piles are a problem.

Potential projects. In its aggressive and professional effort to measure, monitor, and reduce its impact, OFZ Istebné is a model of sound environmental management. To a large extent, the success of the plant's environmental management program obviates the need for USAID technical assistance. The major health impacts of the plant have already been eliminated. The remaining potential environmental problem relates to improving waste storage and preventing displacement of dust or leaching of metals into the ground and surface waters. Three potential projects include:

- (1) Locating or constructing a covered land fill (or abandoned mine) for disposal of the tailings.
- (2) Controlling dust at the existing pile and in the vicinity of the new concrete plant.
- (3) Preventing contamination from runoff of aquifers used for drinking water.

At present there are no data to indicate that any of these are serious environmental health problems. In fact, Dolny Kubin has one of the lowest incidences of respiratory problems and death rates in Slovakia. While the high metal content of the waste pile is a serious concern, the limited health data do not provide the detail necessary to determine the existence or extent of a demonstrated health impact. Given the facility's demonstrated commitment to improving environmental management and the lack of convincing data indicating significant impacts of the existing emissions on human health, the team recommends no technical assistance to the facility.

While OFZ meets or exceeds all pertinent environmental regulations, other sources of pollution in the Dolny Kubin area should be investigated. The paper products plant in Ruzomberok is a major source of pollution and, unfortunately, is located in a large town in a narrow valley.

C. Kovohuti Copper Smelter at Krompachy

The Kovohuti copper smelter at Krompachy is a large copper processing facility in central western Slovakia near Kosice. The smelter is widely recognized as one the worst pollution problems in Slovakia. The plant's ownership is in transition, and because of management complications, the team did not meet with plant managers or conduct a detailed examination. Because of the environmental health implications of the facility's operations, however, the mission did carry out a brief site visit.

The copper smelter is located in a steep and narrow east-west valley adjacent to residential areas of Krompachy. The plant has a single large smelter, which is exhausted through a very tall stack with basic emissions controls. As is typical for this type of facility, there is a sulfuric acid plant, and the principal pollution problem is sulfurous emissions.

Even under the best conditions, a non-ferrous smelter in a small valley is likely to lead to serious environmental problems. The stack for the smelter is unusually tall, even for

such a large facility. It is probably intended to lift the emissions above the surrounding hills into the winds. On the day of the visit, however, the stack was emitting a dense visible plume that did not rise, but was carried directly back over the town. Perhaps more serious are emissions from various low stacks in the subsidiary buildings and substantial fugitive emissions. The emissions gather into clouds that travel just above the ground up the valley, enveloping the town in a dense haze. The odor throughout the valley is very strong, and team members experienced burning eyes and noses immediately on entering the town.

The sulfuric acid plant, which is supposed to be part of the environmental control system, is reasonably modern with many new components. Its state of repair, however, is very poor, and there are many leaks. On the day of the visit, there was a puddle at the base of the unit with a visible scum of elemental sulphur.

The death rate from respiratory causes is 54 percent greater for the district (Spisska Nova Ves) than for Slovakia as a whole, and district statistics certainly understate the plant's impact on its immediate vicinity.

The surrounding area shows unmistakable evidence of significant acidification of the ecosystem. The sides of the valley contain large bare patches and numerous dead trees. The surviving trees are in poor condition, with little or no undergrowth. These are all signs of acidification of the soil and resulting leaching of organic materials. Extensive damage is visible for more than a mile beyond the plant, while sporadic damage extends for two to three miles.

Potential projects. Krompachy appears to be an economically depressed and extensively polluted area. Certainly no area visited by this mission has a greater need for assistance in remediating environmental health hazards. However, the brevity of the team's visit to Krompachy and issues related to the facility's privatization limit the team's ability to propose potential projects at present. However, further exploration of potential technical assistance to this facility could lead to significant improvement in environmental health.

D. VSŽ, a.s. Košice

VSZ Kosice is the largest company, largest employer, and largest single polluter in Slovakia. Its high emissions are a function not of a poorly designed plant or a plant in poor repair, but simply of its size. Air quality in Kosice is among the worst in the country, and the life expectancy of both men and women is lower than the Slovak average and seven to eight years below Western European norms.

This large integrated steel plant principally produces flat products. It receives iron ore from Ukraine and coal from the Czech Republic. Coke is produced in a single large, top-charged coke battery with more than 100 ovens. Three large, modern blast furnaces produce pig iron. Steel is made in two plants with basic oxygen furnaces. Casting is done in batches and in a new continuous smelter. There are facilities for hot and cold rolling and finishing. In addition to rolled steel, the plant produces coke chemicals, vehicle radiators, spiral wound pipe, structural steel, refractory brick (which is used in the furnaces), and

various other products. The structural steel division designs and fabricates bridges and other large structures.

The principal sources of air pollution in the plant are typical of a steel plant—coking, sintering, blast furnaces, steel making, and power generation. The coke ovens are top charging, so emissions are more easily controlled than the side-charging units common in Central and Eastern Europe. While there were no visible emissions from the ovens or the furnace during coking, neither was there any apparent system for controlling emissions during the pushing out. Emissions levels are high while the coke is cooled with water, because this is done with no enclosure. Dust emissions on charging are reported to be a problem.

The three blast furnaces are equipped with electrostatic precipitators and are controlled to the extent practical. The sintering plants currently have no emissions controls, though management hopes to provide such controls. The more critical source of emissions is the power plant, which has six 115MW coal boilers that provide process steam and 60 percent of the plant's electricity. Five of the six boilers are approximately 30 years old and approaching the end of their useful life. Emissions from one boiler are monitored continuously in conjunction with the Hydrometallurgical Institute. The plant is developing a Continuous Emissions Monitoring (CEM) system that will ultimately monitor emissions at all of the power boilers as well as the sinter plant and two steel plants. On the day of the site visit, one steel plant was operating cleanly, but there were dense emissions from the second plant.

With respect to water pollution, the plant operates its own wastewater treatment plant. There is a dephenolization plant on site to treat the water before it reaches the water treatment plant. The plant meets current Slovak standards for discharged water quality. It produces about 3 million tons per year of solid waste, 60 percent of which is recycled. The plant operators are concerned about runoff polluting underground water, but do not have data indicating the extent of the problem.

Overall, the VSZ plant is a solid steel plant operating with good controls in some areas, and little or no control in others. The iron and steel making equipment is modern and in very good condition. This is a competitive plant that should be able to hold its own in the world steel markets, barring a deepening recession in the demand for steel. Because the basic plant is sound, it is practical to proceed with the costly environmental improvements to the sintering plants and the power plant.

Financial considerations. The plant recognizes this imperative and has developed a strategy to bring the plant into compliance with Slovak standards by 1998, at a cost of Sk 8 billion (\$266.7 million). The plan calls for an initial investment of Sk 2 billion over the next two years to upgrade the power plant and make other environmental improvements. The largest single expenditure is the installation of a gas turbine combined cycle unit at a cost of Sk 1.2 billion during the first two years of the program.

VSZ has planned to finance 40 percent, or Sk 3.2 million, of the total investment program. The remainder of the program must be financed from outside sources. The VSZ management committee has established a subcommittee, composed of vice presidents of the finance, strategy, and administration divisions, to search for funding sources. Senior management at VSZ recognizes that a portfolio of funding from various sources will be necessary to carry out the environmental strategy. (Under present conditions, the firm is unable to receive funding from commercial banks outside Slovakia because local commercial banks and the state cannot assume the required guarantees for this joint-stock company.)

To locate suitable funding, the firm has made inquiries of a variety of potential funding sources. Senior managers have initiated a dialogue with the Ministry of Finance to support 30 to 40 percent of the costs. The firm also has forwarded a request to the EBRD to fund the environmental improvements recommended in an EBRD-funded environmental audit of the facility. To date, however, the firm has not been able to secure sufficient funding to implement the environmental improvement program.

Potential projects. Except in the area of continuous emissions monitoring, the plant's engineering capabilities and expertise are demonstrated in its strategy for environmental improvement. The key bottleneck in implementing this strategy is locating suitable financing. Under the environmental investment plan developed by the plant, a total of Sk 8 billion will be required between now and 1999. The firm is committed to providing 40 percent of total funding, but has not been able to locate additional financing.

The mission recommends that USAID provide technical assistance to VSZ in developing financial memoranda, cost accounting, and other financial documentation required to secure outside financing to implement the environmental strategy. The mission's recommendation is based on the following points:

- VSZ has demonstrated its strong commitment to improved environmental management.
- The firm is willing to commit its own capital to environmental improvement.
- The firm has a strong industrial and export position.
- Because the firm is the largest single-point source of pollution in Slovakia, reducing its emissions should have a significant impact on human health.
- The firm's infrastructure is in excellent condition and suitable for cost-effective environmental improvement.

The mission recommends that, following initial agreement between USAID and VSZ for technical assistance, a small team of financial and environmental specialists spend five days at the factory to discuss the environmental improvement strategy. The specialists could also obtain more detailed information on the specific financial requirements of the environmental strategy and discuss avenues for approaching outside funding sources.

E. Kosice Incinerator

Kosice, in eastern Slovakia, is one of the country's most severely polluted towns due to its heavy industrial development. The incinerator at Kosice burns municipal solid waste and sewage treatment sludge as a means of disposing of waste and to supply about 3 percent of the city's heat. Because of the generally high levels of air pollution, the incinerator is of concern, even though it has good controls and is located outside the city away from large residential areas. The plant's solid waste is also a problem because the current land fill is reaching capacity.

The plant has two large boilers that can burn 100,000 tons per year. At present, Kosice contributes 60,000 tons per year. The incinerator is pursuing additional customers. With its current controls, however, it is limited to accepting municipal waste and basic office waste from commercial sources. After the planned improvements, the incinerator will be able to accept a wider spectrum of waste.

Operating at this lower level of capacity utilization, the plant meets Slovak emissions limits for units of this vintage. Oxygen, carbon monoxide, and NO_x are monitored periodically using portable equipment. Chlorine is monitored continuously, because of concern about burning plastics and the possible formation of hydrochloric acid. Until last year, the plant was limited by the emissions levels to its current rate of capacity utilization, but has been granted a waiver to operate at capacity without improved controls until stricter emissions limits come into play in 1999.

The planned improvements will take place in two stages. Stage 1 will include basic improvements to the boilers and a new landfill. The boilers are large moving-grate boilers that accept heterogenous waste, which is essentially unprocessed municipal waste straight from the trucks. Because of the crude fuel, the combustion is very uneven. The temperature varies across the grates, and it is doubtful that the plant achieves the required residence time for all wastes at 850 degrees centigrade. Modifications to the boiler and, possibly, to waste preparation, will be implemented in the first stage of improvements.

The second stage will address improvements to the stack gas control system. At present, the plant operates with an electrostatic precipitator for each boiler. Improvements will add SO_2 controls and catalytic controls for NO_x .

There is general agreement on the basic strategy for improving the plant and making it financially self sufficient through dumping fees. The details remain to be worked out. Kosice has solicited tenders from potential investors. Thirteen were received, reflecting widespread interest in the plant and some conviction that it can be operated profitably. The city deems that six of the 13 bids show a realistic understanding of the technical requirements to improve the plant. The other seven simply address the landfill problem. The incinerator's managers consider three of the six bids to be generally acceptable. Unfortunately, there is no consensus among these tenders on the specifics of the improvements. Staff at the plant said they were not able to evaluate the different engineering options.

Financial considerations. The plant is owned and operated by the city of Kosice. Plans are being developed to create a joint-stock company. The city recognizes that without privatization it cannot fund the minimum \$10 million needed for environmental and capacity improvements at the facility, and that a privatized incinerator will be able to operate more effectively and with reduced emissions. Under the privatization plan, the city will retain 51 percent ownership in the firm. An additional 19 percent will be purchased by Slovak investors, largely municipal and industrial producers of wastes requiring incineration. The final 30 percent of the firm would be available for purchase from a foreign investor in return for a capital contribution.

Potential projects. Projects at the Kosice incinerator are attractive for several reasons. First, Kosice has serious environmental problems, with the air being classified as "very unhealthy." Air pollution is particularly significant for particulate matter and carbon monoxide. Therefore, improvements to the plant should lead to a significant improvement in ambient air quality. Second, the plant has reasonable potential to become financially sustainable. Third, the plant itself is in very good condition, so new investments will be able to leverage the technological investments already made. Finally, the regional authorities and plant managers are professional and appear to welcome U.S. assistance.

USAID technical assistance could take several forms. Possible projects might include:

- (1) Evaluating the proposals to upgrade the boilers.
- (2) Evaluating the impact of waste homogenization.
- (3) Specifying technical requirements for the additional stack gas controls.
- (4) Establishing a continuous emissions monitoring program.
- (5) Assisting in establishing a recycling program.
- (6) Evaluating landfill options and landfill design.
- (7) Assisting in developing a business plan.

Opportunities to provide technical assistance are limited, however, by the incinerator's current transition from a municipal-owned to a joint-stock company. Any proposal for technical assistance must take into account the privatization and potential investment proposals currently under consideration by municipal authorities.

Moreover, while the Kosice incinerator is a valid site for an environmental project, the impact of such a project on environmental health is not clear. Therefore, the mission does not recommend USAID technical assistance for the Kosice incinerator at present.

F. Bukoza-Vranov

The Bukoza-Vranov wood products plant is located in Vranov, in the eastern-most part of the country near the Ukrainian border. Bukoza operates a similar plant in Toplou. The plant was built after World War II to process wood from the forests of eastern Slovakia. The plant is large and its products are varied. The largest part of the factory produces cellulose, a third of which is used for chemical production and the other two-thirds for the

manufacture of paper. The facility includes a sawmill, a plywood plant, and a furniture division that makes a wide range of chairs and upholstered furniture.

The plant has three principal sources of pollution: liquid and solid waste from cellulose production, airborne emissions from the regeneration boiler used to recover sulfur from the cellulose process, and emissions from the large coal-fired steam boilers designed to produce process steam and electricity.

The plant has been relatively slow in making investments for environmental cleanup, perhaps in part because of the formidable problems it faces.

Airborne emissions from the pulping plant are estimated as follows:

Sodium sulfate	512 t/y
Rotary kiln dust	54 t/y
Hydrogen sulfide	10 t/y
Mercaptan	115 t/y
Dimethyl sulfide	2.2 t/y
Dimethyl disulfide	15.5 t/y
Chlorine	44 t/y

The large volume of sodium sulfate emissions could be reduced through filtration, but these emissions are not toxic and should not be a priority. The hydrogen sulfide, mercaptan, and chlorine emissions are serious problems because of their health impact and intense odor. These can be addressed by combustion of the sulfurous compounds and scrubbing.

The liquid waste discharged from the cellulose plant is now treated by mechanical separation and a biological water treatment facility built between 1965 and 1968. The treated liquid discharged into the Ondava river does not meet current standards, and there is no adequate landfill for the solids. BOD₅ is reported to be 33.4 mg/l, which is about 11-12 mg/l too high for a drinking water source.

Rather than pursue these problems individually, the company has considered making improvements throughout the cellulose process to chemical and paper production and the regeneration boiler. The United States financed \$330,000 for a pre-feasibility study, conducted by the engineering and consulting firm Brown and Root, of improvements for increasing the efficiency of operations as well as reducing discharges. The plant economist (Ing. Josef Jacko) reported that this study was "favorable," indicating that the upgrade was both technically and financially feasible. In contrast to the favorable U.S. report, the Swiss firm of Holinger Ltd. reviewed the plant's prospects and concluded that the market for its principal products, nitrocellulose and viscous fibre, is collapsing, the process is out of date, and fundamental changes in the plant are necessary if the plant is to remain viable. Holinger recognized, however, that money for a major overhaul would be difficult to obtain and intermediate solutions may have to be considered. A more detailed study is underway by the U.S. firm Harza. Another study has been done by Professor Lekander, Alingsas, Sweden.

Bukoza is unusual for a wood products plant in that it has a substantial coal-fired power plant. Facilities of this type are usually energy sufficient. This unusual configuration may be related to the original plan to use the plant to supply electricity to other plants, which were never built, and produce cellulose-derived chemicals other than paper. The power plant boilers burn 300,000 t/y of poor-quality brown coal. The ash content is 30 percent. The plant has electrostatic precipitators (ESPs) that should remove at least 99 percent of the emissions, but the plant's environmental engineer said that dust production is so high that even this level of removal is inadequate. There are no controls for SO₂ or NO_x, so emissions of these pollutants are roughly 1 t/hr and .33 t/hr respectively.

The plant has many small boilers, but the most important are two large high-pressure wall-fired boilers burning pulverized coal. Their capacity is 250 t of steam per hour at 120 atmospheres. Acknowledging that the ESPs are not adequate, the only real alternative is to use better fuel. The plant representatives said they were not able to burn a cleaner fuel with a higher heating value, because it would damage the boiler. They are experimenting with coal blending to reduce the ash content yet operate within the boilers' design parameters. This is a good option, but other options should also be investigated. The boilers merit additional research.

Financial considerations. The company has been organized as a joint-stock company since 1989. The financial data provided by the plant are old—for the 1991 calendar year—and pertain to the firm, not the plant. As of 1 January 1992, stockholder equity was reported at Sk 1.876 billion, or \$60 million at current exchange rates. Sales increased from \$32.5 million to \$45.0 million from 1989 to 1991. Profits during that period averaged \$1.8 million per year, with no definite trend. Debt remained roughly constant at about \$6.5 million.

Potential projects. The team does not recommend technical assistance for Bukoza at present. In light of the ongoing study of the cellulose process at the plant, any technical assistance would depend on the study's recommendations for the most cost-effective process changes to increase efficiency and reduce pollution. While technical assistance in cleaning up the boilers, examining options for different coals, refueling, and coal beneficiation could be useful, such assistance would be unlikely to provide significant improvement in environmental quality or human health. Additionally, the firm's lack of commitment to environmental improvement, stemming in part from its financial condition, does not support the provision of technical assistance.

G. Slovensky Energeticky Podnik

Slovensky Energeticky Podnik (SEP) is a state-owned electric utility that generates electricity and transmits it to distribution companies. The utility also operates two large district heating facilities that supply power to the grid. SEP is undergoing privatization, though plans call for the state to retain majority ownership.

In 1993, SEP had an installed capacity of 5,846 MW, distributed as follows:

Nuclear	1,760.00 MW
Conventional thermal	1,989.80 MW
Hydro	1,360.96 MW
Hydro pumped storage	735.16 MW

Total generation in 1993 was 20,577 GWh, of which 11,000 was by nuclear power. In addition to generating electricity, the company delivered 10,204 TJ of heat in the form of hot water and process steam. The company earned a 1993 profit of Sk 9.3 billion on sales of Sk 28,667 billion.

SEP's thermal capacity is housed in a small, medium, and large power plant. Novaky, the medium-sized plant, is located in a valley in an industrial area 15km from the city of Priavidza in central Slovakia. Vojany is a large 1,300+ megawatt plant near the town of Vojany in eastern Slovakia, near the Ukrainian border. The third and smallest plant is located in the east in Kosice, the country's second largest city. The Kosice plant also provides heat as part of the city's district heating system. In addition to the power plants, the company operates a comparatively small district heating plant in the town of Handlova.

All units at Novaky and Kosice operate with electrostatic precipitators, as do boilers No. 1 and 2 at Vojany. One of the boilers at Novaky and the boilers at Vojany use two stage units with removal efficiencies of 94 and 98 percent. The remaining three stage units operate at a higher 99.6 percent, which is typical of ESP, although 99.9+ is technically possible. Boilers 3,4,5, and 6 at Vojany I have cyclones and average 81.2 percent removal, which is not acceptable for a large power plant. No unit operates NO_x controls, but all meet Slovak NO_x standards through low NO_x burners. No unit has SO₂ controls.

The coal burned at Vojany and Kosice has a high sulfur content and a moderately high ash content, but is good by regional standards, given its very high heating value. The quality of the coal at Novaky is appalling; this coal is certainly among the worst burned in any large power plant. Its heating value is very low, and the sulfur, ash, and moisture content are very high. The characteristics of the coal are summarized below, using wet measurements. Vojany II is a dual-fired gas/oil unit.

Average Coal Used at SEP Coal-Fired Power Plants

Coal Component	Novaky	Vojany I and Kosice
Heating Value	9.5 MJ/kg	24.89 MJ/kg
Sulfur Content	1.8%	2.0%
Ash Content	30.0%	19.8%
Moisture Content	27.1%	6.53%

An assay of the dust at Novaky shows nominal levels of most toxic elements, but a high level of arsenic at 0.25 percent. The company attributes this to the coal from one of the eight mines that supply the plant. SEP has a series of emissions problems:

- (1) The oil boilers at Novaky A are at the end of their useful life.
- (2) The two stage ESPs at Novaky and Vojany I, boilers 1 & 2 are not adequate.
- (3) Vojany I boilers 3,4,5, and 6, have no particulate controls beyond mechanical separators.
- (4) The quality of the coal at Novaky is extremely poor.
- (5) None of the plants has sulfur controls.
- (6) The arsenic emissions at Novaky are too high.

The company is well aware of these problems, and has prepared the following plan to reduce emissions:

- For Novaky A: Replace small boilers with fluidized bed combustors in four stages by 1999.
- For Novaky B: Add a wet limestone scrubber by the end of 1994.
- For Vojany I, Units 1 and 2: Add a wet limestone scrubber and NO_x control between 1996 and 1998.
- For Vojany II: Replace all units with gas turbine combined cycle power plants. Replace two units in 1995/1996, two in 1996/1997, and two in 1997/1998.
- For Kosice Power Plants: Replace Units 1 and 2 with gas turbine cogeneration system between 1994 and 1996. Add a desulphurization plant to Units 3 and 4 between 1997 and 2000.
- For Kosice Heating Plants: Add NO_x controls to Units 3 and 4 between 1997 and 2000.

If fully implemented, the changes will bring SEP's emissions down to the best Western standards. These changes represent considerable investment, however, which may be difficult to manage at a time when the utility is undergoing privatization, completing a large nuclear power plant, and operating at only two-thirds of capacity, and when the market for power export is small.

Potential projects. USAID technical assistance offers an opportunity to increase SEP's financial resources to accelerate its modernization and environmental protection program. Managers at the firm suggested that the program is ongoing, but that its pace is limited due to financial constraints. Increased financing would accelerate completion of environmental improvements and reduce emissions of sulfur and arsenic.

At present, the mission does not recommend USAID technical assistance for SEP. Financing has been available from other sources (i.e., the Government of Austria) for the

project, and it is most likely that these sources would boost funding if appropriate. Additionally, one major approach for reducing emissions at Novaky is to change fuel types and switch to a higher-quality coal. This switch would not require technical assistance.

H. Chemolak, a.s.

Chemolak is a small paint company in Smolenice in eastern Slovakia, at the foot of the Carpathian mountains near the Austrian border. The plant makes latex-based and oil-based paints and varnishes for wood and metal. The company produces the basic resins for its paint on site. Chemolak's sales are principally to Slovakia and the Czech Republic. The company has earned a small profit in recent years despite poor economic conditions in the principal markets, but has benefited from a protected market. During the period of reported profits, the workers' nominal salaries were cut in half.

The company has three environmental problems: (1) volatile organic compounds (VOCs) in the plant, (2) volatile emissions from the products, and (3) contamination of the soil and groundwater from oils and metals. The vapor problem within the plant would be largely addressed by changes in the equipment necessary to shift the product line to water based paints. Additional vapor control, if necessary, is a straightforward engineering problem that first requires attention to housekeeping and maintenance to reduce emissions. Then vapors that cannot be eliminated are collected and concentrated. The concentrated vapors could then be routed to the steam boilers or to filtering canisters.

There has been no monitoring of VOC levels within the plant, of worker exposure, or of health impacts on workers. A more comprehensive and quantitative study should be done before proceeding to correct the problem, and regular monitoring should be undertaken to ensure that the new systems are performing properly. Technical assistance would be appropriate in monitoring, designing the vapor collection system, analyzing the boilers to ensure they are adequate to destroy the VOCs, and designing the permanent monitoring system.

The imperative to reduce emissions from Chemolak's products is rooted in the Copenhagen treaty. The treaty requires Slovakia to reduce VOC emissions to limit transboundary effects, principally on Hungary. Emissions of VOCs at the plant are about 100 t/y, but emissions from the products, when used, are on the order of 20,000 t/y. Reducing emissions therefore rests on reducing the amount of solvents in the paints and replacing the oil-based paints with non-latex water-based paints. These water-based paints account for only a small percent of Chemolak's production. This shift in production will require new process equipment.

The plant deems the third category of impact as the most important. The soil and the aquifer around the plant are contaminated with oil residues and the wide spectrum of metals associated with paint production. For many years, the plant did not have a safe storage facility for wastes. A new storage facility that meets standards was recently completed at a cost of Sk 50 million. While the plant has succeeded in stopping further damage to the environment, the residual problem is considered serious. The company wants to undertake *in*

situ biological decontamination of the soil. It also wants to extract waste from the aquifer, decontaminate it, and reinject the clean water.

Potential projects. Two potential technical assistance projects exist at Chemolak. The exposure of approximately 350 employees to very high levels of VOC represents a significant occupational health issue. The most likely mitigation of this exposure is through the construction of a ventilation system to remove VOCs from the workplace and, through a forced-air system to the boiler, pyrolyze the emissions. This is technically simple and relatively low cost. It does not, however, solve the issue of reducing the volume of VOC emissions from the largest source: use of solvent-based products by end-users. This larger source can only be reduced by switching the product line from solvent-based products to water-based products. Emissions at the plant are minor in terms of general health impacts, however, though there may be a problem with occupational exposure.

The second potential project involves assessing the technical feasibility of cleaning up the underground water resources. As noted above, the plant plans to use biological methods to clean up soil and groundwater that has been heavily contaminated with poly aromatic hydrocarbons (PAHs) and oil products. Both of these pollutants could represent a significant health hazard if they have migrated into drinking water resources. At present, there is insufficient data on the possible risk of contamination to the drinking water reserves, but the factory believes that potentially significant degradation could be taking place.

At present, Chemolak can continue to produce solvent-based products. If, however, the Slovak government issues regulations on VOC emissions to meet the terms of the Copenhagen treaty, Chemolak will likely have to move toward the production of water-based products. Doing so will not be accomplished easily and may threaten the company's survival. The environmental impact, however, would be very positive. If VOC regulations are promulgated, Chemolak would certainly emerge as a major candidate for technical assistance.